Application No. 10/824,594
Attorney Docket: ND-448US (HAR.024)

REMARKS

Entry of this Amendment is proper because it narrows the issues on appeal and does not require further search by the Examiner.

Claims 1-9 and 20-24 are all the claims presently pending in the application. By this amendment, claims 5 and 20 are amended. The amendments introduce no new matter.

It is noted that the claim amendments, if any, are made only to assure grammatical and idiomatic English and improved form under United States practice, and are not made to distinguish the invention over the prior art or narrow the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-3, 5-9, and 20 stand rejected under 35 U.S.C. §102(e) over Iselt (US 6,917,582). Claims 4 stands rejected under 35 U.S.C. §103(a) over Iselt in view of Zhang (US Patent Application Publication 2003/0016148). Claims 21-23 stand rejected under 35 U.S.C. §103(a) over Iselt in view of Rey, et al. (US 7,035,069). Claim 24 stands rejected under 35 U.S.C. §103(a) over Iselt in view of Rey, and further in view of Galy, et al. (US 5,689,632).

These rejections are respectfully traversed in the following discussion.

THE CLAIMED INVENTION

The claimed invention is directed to an information processing apparatus. A first and second processing means perform the same process in synchronism with each other. Adjustment means adjust orders of output data from the first and second information processing means so as to correspond to each other to discriminate whether or not the output data coincide with each other. A re-construction means re-constructs a plurality of output data of the second information processing means, based on a plurality of output data of the first information processing means. A comparison means compares the output data of the first information processing means and the output data of the second information processing means with each other.

The information processing apparatus can thus discriminate, even when the orders of output data of a plurality of CPU modules differ from each other, whether or not the operations of the CPU modules coincide with each other.

In a conventional information processing apparatus for use with a fault-tolerant system, even if each of the plurality of processors normally operates, an interruption timing for interruption handling of one of the processors sometimes displaces output of one processor from that of the other processor, thereby making the timings or the orders of output data of the processors different. If the order of the output data of one of the processors changes, then the output data of the processors become different from each other at a certain point of time. Therefore, the lack of coincidence of the output data of the processors is detected in error, as described on pages 1-2 of the specification.

The claimed invention, on the other hand, provides an information processing

apparatus which can discriminate, even if the orders of output data differ from each other or if any of output data is interrupted, whether or not the operations of the CPU modules coincide with each other.

THE PRIOR ART REJECTIONS

The Iselt Reference

Claims 1-3, 5-9, and 20 stand rejected under 35 U.S.C. §102(e) over Iselt. Claim 4 stands rejected under 35 U.S.C. §103(a) over Iselt in view of Zhang. Claims 21-23 stand rejected under 35 U.S.C. §103(a) over Iselt in view of Rey. Claim 24 stands rejected under 35 U.S.C. §103(a) over Iselt in view of Rey and further in view of Galy. Applicant respectfully traverses these rejections.

The Examiner alleges that Iselt teaches certain features of the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Iselt. Zhang and Rey fail to overcome the deficiencies of Iselt.

Applicant maintains the arguments entered in the Amendment of July 2, 2007. Some of those arguments are repeated below for the Examiner's convenience.

With regard to independent claim 1, Iselt fails to disclose or suggest at least "An information processing apparatus, comprising: first and second information processing means for performing a same process in synchronism with each other; and adjustment means for adjusting orders of output data from said first and second information processing means so as

to correspond to each other to discriminate whether or not the output data coincide with each other," as recited in the claim.

The Examiner alleges that Iselt discloses, "first and second information processing means for performing the same process in synchronism with each other (ATM cell stream is split into two redundant data streams that are routed via different paths, fig. 1, col. 3 lines 5-10)." Office Action, p. 4

However, Iselt fails to disclose or suggest first and second information processing means, as recited in the claim, and as further defined in new claims 22-24. Such a feature is integral to at least these claims.

Instead, Iselt discloses only two data streams. "*FIG. 1 shows a device on which the inventive method is run. An ATM cell stream is split into two redundant data streams that are routed via different paths W_0, W_1 separately and independently of one another.*" Iselt, col. 3, lines 7-10.

Further, the two data streams of Iselt are split from a single data stream, as described above. Iselt is concerned with ensuring the integrity of a single source data stream. Thus, coincidence of the data streams to W_0 and W_1 provides no indication whatsoever whether the data is correctly calculated. An error in the original ATM cell stream of Iselt would result in identical errors in both redundant data streams, even when said data streams are received without additional error.

The present invention, in sharp contrast, requires at least first and second information processing means, such that the output of one can corroborate the output of the other.

In response to the above argument, the Examiner alleges, "*Given the broadest interpretation of the claim language, the examiner equates the two data streams of Iselt to applicant's two processing means. The term an information apparatus, comprising: first and second information means is broad enough to encompass the synchronizing data streams of Iselt where the different paths in which the data travel would subject them to different process thereby creating different processing means.*" Office Action, p. 2.

The Examiner provides no support for the allegation that the two data streams of Iselt are subject to different processing. Iselt discloses only that the original data stream is split, "*into respectively two congruent, redundantly fashioned data sub-streams.*" Iselt, col. 2, lines 30-31.

Further, one skilled in the art would not understand the two data transmission sub-streams of Iselt to be information processing means.

The Examiner further alleges that Iselt discloses, "*adjustment means (merge the data streams, fig. 1, col. 3 lines 5-20) for adjusting orders of output data from said first and second information processing means so as to correspond to each other to discriminate whether or not the output data coincide with each other (fig. 3b-3c, comparison of the two ATM cells leads to an inequality in the pair-by-pair comparison during failure recognition phase, col. 4 lines 43-57 and col. 5 lines 1-16).*" Office Action, p. 4.

However, Iselt fails to disclose or suggest at least adjustment means for adjusting orders of output data from said first and second information processing means, as recited in the claim.

Instead, Iselt discloses only comparing the redundant data streams, and after making a comparison, then deleting cells that do not match between the streams; the orders of the output data are unaffected. Iselt outputs ATM cells only in the original order in which they are received; later cells input are always output after, never before, earlier cells. "*The ATM cells are compared to one another in a comparator V. These procedures are controlled and monitored by a controller ST. Based on the criterion of the inventive method, the ATM cells are taken from the buffer memories and supplied to further devices via a path W.*" Iselt, col. 3, lines 13-20. "*Beginning with the confirmation phase and during the following failure recognition phase, the respectively oldest ATM cell of the leading data stream is deleted from the buffer memory given a correct pair-by-pair comparison.*" Iselt, col. 4, lines 27-31. Thus, in a case where the data streams are determined to coincide, the leading ATM cell and corresponding trailing cell are deleted. "*After eliminating a failure, the data stream that is again available is synchronized with the existing one.*" Iselt, col. 6, lines 15-16.

In response to the above argument, the Examiner alleges that, "Deleting a first entry in the buffer would change the order of data in the buffer thereby changing the orders of the data." Office Action, p. 2.

However, the claim recites the feature "adjustment means for adjusting orders of output data from said first and second information processing means so as to correspond to each other to discriminate whether or not the output data coincide with each other." The claim specifically recites that the orders are adjusted to discriminate whether or not the output data coincide with each other. That is, such discrimination is dependent on the adjustment of

the orders of the output data. The adjustment of order is performed, if at all, prior to discrimination.

In stark contrast, and as discussed above, Iselt discloses deleting a leading cell or cells from the buffer queues after comparison of the two data sub-streams. Iselt compares whatever cells are in the leading position in the buffers, in the order they are received, without requiring any adjustment of order to conduct the comparison.

The present invention adjusts the output orders, if at all, prior to comparison that depends on such adjustment.

Iselt deletes data cells from the buffers after the data sub-streams have been compared. Such comparison of the data streams does not rely on any adjustment of order to determine whether or not the outputs coincide with each other.

Further, by the Examiner's urged interpretation, any deletion of cells from a buffer, the buffer being depicted as a well-understood first-in, first-out (FIFO) queue, is alleged to be an adjustment of the order, not content, of the data.

One skilled in the art would not understand deleting the leading cell from a buffer modeled as a FIFO queue to be an adjustment of the order of the output. That is, the data cells are always deleted from the front of the output of each data stream in the same order in which they are received.

Hence, turning to the clear language of the claims, in Iselt there is no teaching or suggestion of "first and second information processing means for performing a same process in synchronism with each other; and adjustment means for adjusting orders of output data from said first and second information processing means so as to correspond to each other to

discriminate whether or not the output data coincide with each other," as required by independent claim 1.

Claims 2-4 and 20-24 depend from independent claim 1, and inherit all features and limitations thereof. Applicants submit that claims 2-4 and 20-24 are patentable for at least this reason, as well as for the additional features they recite.

With regard to independent claim 5, Iselt fails to disclose or suggest at least "first and second information processing means for performing a same process in synchronism with each other; and adjustment means including re-construction means for re-constructing a plurality of output data of said second information processing means based on a plurality of output data of said first information processing means; and comparison means for comparing with each other the output data of said first information processing means and the output data of said second information processing means re-constructed by said re-construction means," as recited in the claim.

Applicant repeats the arguments of claim 1, above, with respect to similar features recited in claim 5.

Iselt fails to disclose or suggest at least first and second information processing means, as discussed above.

Further, Iselt fails to disclose or suggest re-construction means for re-constructing a plurality of output data of said second information processing means.

The Examiner alleges that Iselt discloses, "adjustment means including re-construction means for re-constructing a plurality of output data of said second information

processing means based on a plurality of output data of said first information processing means (merge the data streams, fig. 1, col. 3, lines 5-20)." Office Action, p. 5.

Instead, Iselt discloses only, "*An ATM cell stream is split into two redundant data streams that are routed via different paths W_0, W_1 separately and independently of one another. The data streams are turn merged in a device according to FIG. 1.*" Iselt, col. 3, lines 8-11. Iselt discloses only comparison and output of ATM cells as received. Iselt fails to disclose or suggest re-construction of any data.

In response to the above argument, the Examiner alleges, "Similar to claim 1, examiner equates applicant's two processing means to Iselt two data stream and when comparing detect various discrepancies in the data streams, faulty ATM cells may be removed from the data stream to reconstructing a data of said second information processing means." Office Action, p. 3.

Applicant repeats the above arguments with regard to independent claim 1.

Further, the Examiner offers no support for the novel redefining of "re-constructing" from its plain meaning to also include a meaning of removing faulty ATM cells from the otherwise unadjusted data stream.

Claims 6-7 depend from claim 5, and inherit all features and limitations thereof. Applicants submit that claims 6-7 are patentable for at least this reason, as well as for the additional features they recite.

With regard to independent claim 8, Iselt fails to disclose or suggest at least "An information processing apparatus, comprising: first and second information processing means for performing a same process in synchronism with each other; and adjustment means for selecting one of a plurality of data of a second output of said second information processing means which data is determined to correspond to one of data of a plurality of data of a first output of said first information processing means to detect whether or not the data of the first and second outputs coincide with each other," as recited in the claim.

Applicant repeats the arguments of claims 1 and 5, above, with respect to similar features recited in claim 8.

Iselt fails to disclose or suggest first and second information processing means, as discussed above.

Further, Iselt fails to disclose or suggest both "selecting one of a plurality of data of a second output ... which data is determined to correspond to one of data of a plurality of data of a first output," and "to detect whether or not the data of the first and second outputs coincide with each other," as recited in the claim.

Instead, as discussed above, Iselt discloses only comparing the data streams to determine whether the ATM cells match each other. Iselt fails to distinguish between determining which data correspond to each other, and then separately comparing the contents to determine whether the corresponding outputs coincide in their data values. That is, Iselt is incapable of correctly identifying two data outputs as corresponding to each other but incorrectly having different data values. Such a feature is necessary to compare the data outputs of the first and second information processing means.

Instead, Iselt discloses only a failure – that is, detecting whether two ATM cells in the data streams are not identical. Iselt is unable to distinguish a case wherein the two data streams contain data that correspond (that is, the correct two cells are being compared) but differ in their data, from a case wherein one or more data of a data stream are lost or damaged.

The present invention, in contrast, provides a check on the first and second information processing means by comparing the corresponding data outputs of the first and second information processing means. Iselt provides no ability to check on the proper functioning of the first and second information processing means; any error in the original data stream would be reproduced and not detected when split into two independent data streams.

Claim 9 depends from claim 8, and inherits all features and limitations thereof. Applicants submit that claim 9 is patentable for at least this reason, as well as for the additional features it recites.

Therefore, the Examiner is respectfully requested to reconsider and withdraw the rejections of claims 1-9 and 20-24.

CONCLUSION

In view of the foregoing, Applicant submits that claims 1-9 and 20-24, all the claims presently pending in the application, are patentably distinct over the prior art of record and are allowable, and that the application is in condition for allowance. Such action would be appreciated.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned attorney at the local telephone number listed below to discuss any other changes deemed necessary for allowance in a telephonic or personal interview.

To the extent necessary, Applicant petitions for an extension of time under 37 CFR §1.136. The Commissioner is authorized to charge any deficiency in fees, including extension of time fees, or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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